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PRELIMINARY REVIEW AND ESTIMATE

OF

MINERAL PRODUCTION, 1912

BY

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To the Hon. Sir Richard McBride,

Minister of Mines, British Columbia.

Sir,—I beg to submit herewith a preliminary estimate of the mineral production of the Province for the year 1912, together with some notes on the progress of the mining and metallurgical industries during the year just closed; the information herein presented is, of course, subject to revision.

The object of this preliminary estimate and review is to give, as promptly as possible after the close of the year, an approximate statement of the condition of the mining interests, without waiting until the official returns from the mines have been received, and without the delay that of necessity must take place in carefully preparing the detailed information given each year in the Annual Report of the Minister of Mines.

I have the honour to be,
Sir,
Your obedient servant,

William Fleet Robertson,
Provincial Mineralogist.

Bureau of Mines, Victoria, B.C.,
January 13th, 1913.

101-03511/

PRELIMINARY REVIEW AND ESTIMATE

—OF—

MINERAL PRODUCTION FOR THE YEAR 1912.

THIS bulletin has been prepared before the receipt of the official reports for the year 1912 of the Gold Commissioners and Mining Recorders of the Province, and the customary returns of mineral production annually made by managers of mines and reduction-works; consequently, it must necessarily be regarded as being simply a preliminary review of the progress of the past year, together with an estimate of the quantities and value of the several mineral products of the Province, which it is believed will prove to be approximately correct.

The accompanying table shows an estimated mineral production during 1912 of a total value of $32,606,000. It will be seen that the total value of production in 1912 is expected to be $9,106,928 more than in 1911, and more by $6,228,934 than that of 1910, the total for the last-mentioned year ($26,377,066) being the highest on record in the history of mineral production in British Columbia.

CONDITIONS FAVOURABLE FOR PRODUCTION IN 1912.

Conditions during the year 1912 were, on the whole, favourable to an increased mineral production, and the results obtained must be regarded as highly satisfactory, although in some respects the earlier expectations were not fully realized; for instance, an unusually dry and short working season affected the production of placer gold; the yield of lode gold also fell short of what had appeared earlier in the season, a reasonable promise from all the districts contributing substantially to the total production of that metal. The production of lead also seems to have been somewhat less than had been anticipated, although it is quite possible that it will be found to have been underestimated.

In coal also the increase in production is smaller than had been looked for, but this is explained by the fact that during the last quarter of the year, labour troubles affected adversely the output of the Cumberland and Extension Collieries on Vancouver Island. With these exceptions, however, conditions were favourable for the production of minerals in larger quantities than in several years past.

Average prices for the year of silver and copper, especially of the latter, induced efforts to maintain production on as large a scale as was practicable; one of the good results was an output of copper that, as regards both quantity and total value, is the highest on record in the Province.

PROVINCE'S PROPORTION OF PRODUCTION IN CANADA.

British Columbia's proportion of the mineral production of the whole of Canada continues to be comparatively large. The aggregate value of the production of this Province to the end of 1912 is, approximately, $450,000,000, but since the published official records of that of the whole Dominion do not

include production prior to 1886, the present comparison must be restricted to the period of twenty-seven years—1886-1912. Placing the aggregate for all Canada at $1,352,000,000 (which allows for 1912 a Dominion total of $116,000,000, an amount nearly $13,000,000 greater than that of 1911), and British Columbia's proportion for the same period at $365,000,000, it follows that this Province has to be credited with about 27 per cent. of the aggregate value of the mineral production of the whole of Canada in the twenty-seven-year period under notice.

It is a striking fact, as indicating the substantial increase in the value of the mineral production of the Province in recent years, as compared with that of less than twenty years ago, that nearly 36 per cent. of the $365,000,000 mentioned above as the aggregate of production for twenty-seven years is to be credited to the last five years, 1908-1912, while nearly one-half was produced during seven years, 1906-1912.

MINERAL PRODUCTION FOR TWO YEARS, 1911-1912.

The following table shows the quantities and value of the several minerals produced in the year 1911, and the estimated production in 1912. It may here be explained that the prices used in calculating the estimated value for 1912 of silver, lead, copper, and zinc are the average prices for the year, as published in *The Engineering and Mining Journal*, New York, less a deduction of 5 per cent. off silver, 10 per cent. off lead, and 15 per cent. off zinc.

	Production, 1911.		Estimated Production, 1912.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer ....oz.	....	$ 426,000	....	$ 500,000	$ 74,000	....
" lode ..... "	228,617	4,725,513	240,000	4,960,800	235,287	....
Total gold	....	$5,151,513	....	$5,460,800	$309,287	....
Silver .....oz.	1,892,384	958,293	2,900,000	1,676,200	717,907	....
Lead..... ....lb.	26,572,397	1,069,521	28,000,000	1,520,000	450,479	....
Copper ..... "	36,927,656	4,571,544	51,000,000	8,338,500	3,766,956	....
Zinc..... ..... "	2,634,544	122,092	8,500,000	501,500	372,408	....
Total metalliferous.	.....	$11,880,063	.....	$17,497,000	$5,616,937	....
Coal.....tons, 2,240 lb.	2,193,962	7,675,717	2,656,000	9,275,000	1,599,283	....
Coke..... " "	66,005	396,030	264,000	1,584,000	1,187,970	....
Building materials, etc ...	.....	3,547,262	.....	4,250,000	702,738	....
Total value of production	.....	$23,499,072	.....	$32,606,000	$9,106,928	....

PRODUCTION OF VARIOUS MINERALS BRIEFLY REVIEWED.

In order to indicate in a general way the sources of the various minerals mined in the Province and to give an idea of some of the conditions that affected their production, and, incidentally, brief information concerning the larger known mineral deposits occurring in British Columbia, the next following comments are submitted.

Gold.

No hesitation has been felt in estimating that the yield of gold, both placer and lode, has been larger than in 1911. For placer gold, an increase

in value of $74,000, and for lode gold $235,287 (equivalent to the value of 11,383 oz. of refined gold), has been taken as fairly representing the production of this metal, so far as indicated by the advices received to date. Dealing with these classes of gold-mining separately, it may be observed:—

Placer Gold.—Practically all the placer gold recovered in the Province is obtained in the Cariboo and Cassiar Districts, less than one-twentieth of the total coming from the remaining districts. An approximate apportionment is: From Cariboo District, $230,000; Atlin Division of Cassiar District, $250,000; remaining parts of the Province, $20,000. In Cariboo Division about $160,000 is the estimate for 1912, as against $136,000 in 1911; $60,000 for Quesnel Division, as compared with $34,000; and $10,000 for Omineca. It may be that for Quesnel Division a larger yield will be shown, but this cannot be determined until after the results of the season's operations of the Quesnelle Hydraulic Gold Mining Company shall be known.

As in 1911, the gravel-washing season was short in both the Cariboo and Cassiar Districts, and, as a consequence, the total quantity of gold recovered was small as compared with that of a number of years prior to 1909. It is a remarkable fact that, while the summer and autumn rainfall in the parts of the Cariboo District to the north and south of the goldfields was abundant, in the parts affecting the water-supply for placer-mining purposes it was unusually light. From Atlin, too, have come advices of the unfavourable effect of water conditions, with a consequent diminished recovery of gold on two or three creeks. However, it is hoped that the season of 1913 will be a better one.

Renewed attention is being given to Omineca creeks, which in bygone years yielded much placer gold. Other parts of the Province in which placer-mining is done, though only on a small scale, are, on several creeks and rivers in the Fort Steele Division of East Kootenay; in Nelson, Trout Lake, and Revelstoke Divisions of West Kootenay; in Lillooet and Clinton Divisions, and several others.

Lode Gold.—The increase in lode gold appears to have come chiefly from the Boundary District, in which is included Osoyoos as well as Grand Forks and Greenwood Divisions, with a production of about 17,000 oz. more than in 1911. Returns from Nelson Division are incomplete, but an increase of between 1,000 and 2,000 oz. is estimated. For some reason not yet ascertained, there seems to have been a smaller total output of ore from the Rossland mines, with a resultant decrease in production of gold; possibly final returns will show differently, but from information so far received the estimate has had to be made of a reduction of several thousand ounces as compared with 1911. In the Coast District, too, there seems to have been a decreased production of lode gold, attributable in part to a temporary suspension of shipment of first-class ore from Texada island, pending the completion of some necessary development-work in the chief producing mine.

In the Boundary District a comparatively large proportion of the gold is obtained by smelting ores of which the main valuable metal content is copper. The Granby and British Columbia Copper Companies together produced about 67,000 oz. of gold; the money value of the product of the Hedley Gold Mining Company was equal to approximately 37,000 oz. of refined gold. In the Rossland camp (Trail Creek Division) the largest producer by far is the Consolidated Mining and Smelting Company of Canada, which operates the *Centre Star-War Eagle* group of mines and the *Le Roi*. Next comes the *Le Roi No. 2, Ltd.*, which also produces gold-copper smelting ore. The Trail Creek Division, like the Greenwood, in 1912 had a new producer added to its list—the *Inland Empire*. That in Greenwood Division was the *Jewel*. Both

commenced milling gold-ore late in the year, so that their respective yields of gold were small.

In the Nelson Division, the *Queen* and *Mother Lode*, in Sheep Creek camp; the *Arlington*, at Erie; and the *Granite-Poorman*, near the town of Nelson, contributed most of the lode gold—approximately 20,000 oz., comprising the total for the year of this division. The *Yankee Girl*, at Ymir, and the *Second Relief*, at Erie, were both producers, but to what extent has not yet been learned.

Silver.

The production of silver appears to have been the largest in any of six or seven recent years. It was more than 1,000,000 oz. larger than in 1911, and 450,000 oz. greater than in 1910. To the total of about 2,900,000 oz., the Boundary District copper-mines contributed something like 390,000 oz., and the Coast mines 102,000 oz., the *Britannia* mine having been the chief producer on the Coast. The remaining 2,408,000 oz. came from the Kootenay District mines, the largest part being from Slocan mines, the chief producers among which were the *Standard* and *Van-Roi*, both in Silverton camp, near Slocan lake, with the *Rambler-Cariboo* adding a fair share. In the Ainsworth Division there were more than half a dozen shippers of silver-bearing ore—namely, the *No. 1*, *Silver Hoard*, *Bluebell*, *Utica*, Retallack & Co.'s *Whitewater*, and two or three smaller mines. The *Sullivan*, in East Kootenay, added between them 250,000 and 300,000 oz. to the total.

More than two-thirds of the output of silver was recovered at the Trail smelter, and nearly 500,000 oz. from smelting ores in the Boundary and Coast Districts, while practically all the remainder was contained in silver-zinc concentrates sent to the United States for reduction.

The New York price of silver was higher all through the year than the average of the highest month in 1911. Commencing with 56.260 cents for January, it rose to nearly 64 cents toward the close of the year, giving an average for 1912 of nearly 61 cents, as against 53.304 cents for 1911; so that production in 1912 had the benefit of fully 7 cents increase in price, as well as the larger quantity already mentioned.

Lead.

In placing the production of metallic lead at 38,000,000 lb., it is thought an ample margin has been allowed for loss in smelting. The quantity of lead contained in ores sent to reduction-works in 1912 is stated to have been between 44,000,000 and 45,000,000 lb. A rough apportionment of the sources of this lead is as follows: East Kootenay, mainly from the *Sullivan* mine, 16,000,000 lb.; Ainsworth Division, 7,000,000 lb.; Slocan, in largest part from the *Standard* and *Van-Roi mines*, 19,500,000 lb.; Nelson Division, largely from the *Emerald* and *Molly Gibson* mines, 2,500,000 lb. These figures indicate in a general way the lead-producing districts and the lead-content of the ores shipped, not the metallic lead recovered.

Lead-ore receipts at the Trail smelter from the *St. Eugene* mine in 1912 were small as compared with those of earlier years. Others than those already mentioned that shipped lead-ore in considerable quantity were: The *Monarch*, at Field; *Utica* and Retallack & Co.'s *Whitewater* mine, in Ainsworth division; *Rambler-Cariboo*, *Richmond-Eureka*, and *Ruth-Hope* groups, in Slocan.

Lead-bounty matters are receiving the attention of mine-owners in the lead-producing districts, for under the existing Dominion Act the payment of bounty "shall cease and determine on June 30th, 1913." Efforts are being made to obtain continued assistance in some effective form. The amount of

bounty earned in 1912 was only about $65,000, the London price of lead during about seven months having been above that at which bounty ceases to be payable. There remains something like $700,000 unearned of the original appropriation of $2,500,000.

Copper.

The estimated increase in the copper production as compared with 1910 is about 12,756,000 lb.; with 1911 it is 14,072,000 lb. Going back to earlier years, the comparison does not appear favourable, but in point of fact it is, since the total of 51,000,000 lb. estimated for 1912 is the quantity of copper actually recovered, while some years ago it was customary to record the copper-content of the ore without allowing for loss in smelting. The increase in production for last year is therefore much greater in comparison with that of any one of the years 1906-1909, inclusive, than is at first evident. The copper-content of ores smelted in 1912, as shown by assays, was approximately 62,000,000 lb., so a liberal allowance has been made for losses in the slags.

As in past years, the Boundary District mines were the largest producers of copper, with a recovery of fully 33,000,000 lb., two-thirds of which came from the Granby Consolidated Co.'s mines at Phoenix, and one-third from those of the British Columbia Copper Co. situated in other parts of the district. The latter company owns a controlling interest in the New Dominion Copper Co., so the production of the *Rawhide* mine, in Phoenix camp, is included in the quantity shown as British Columbia Copper Co. production. Copper recoveries from Rossland ores appear to have been about 2,330,000 lb., while the Coast mines are credited with between 15,000,000 and 16,000,000 lb., nearly all of which was from the Britannia Co.'s mines near Howe sound, with the remainder, except a small quantity from the *Red Cliff* in the Portland Canal Division from the *Marble Bay* mine on Texada island.

It is noteworthy that copper now leads in aggregate value of production of individual metals in all years; that is, if placer and lode gold be taken separately. The respective aggregate figures are: Copper, $73,653,000; placer gold, $72,139,000; lode gold, $70,497,000. The development of the copper-mining industry in the Province may be strikingly illustrated by comparing the relative totals of these several metals as at the close of the year 1900 with those just given. They were: Placer gold, $62,584,000; lode gold, $12,813,000; copper, $4,363,000. Comparison of these figures shows that copper has taken a leading place in the metalliferous production of British Columbia, for while during the twelve years, 1901-1912, the total production of lode gold has been valued at $57,684,000, and of placer gold only $9,555,000, that of copper has been $69,291,000.

Zinc.

The adverse conditions that throughout 1911 affected the production of zinc, so far as concerned the *Whitewater* and *Lucky Jim* mines, in the Slocan, continued until 1912 was well advanced toward its close. In fact, they still exist, as affecting the *Whitewater* group, for the concentrating-mill destroyed by fire in the summer of 1910 has not yet been replaced, although transportation facilities have been restored. The latter improvement made it practicable for the shipment of zinc-ore from the *Lucky Jim* mine to be resumed in the autumn.

Most of the zinc-bearing material shipped was in the form of concentrate, made as a second product in mills concentrating ores also containing lead and silver. In round figures, the zinc recovered from concentrates was as follows: From the Standard Co.'s shipments, 2,706,000 lb.; Van-Roi Co.'s, 2,317,000 lb.; *Monarch* mine, 1,000,000 lb. Recovery from *Lucky Jim* ore shipped crude was

probably 3,000,000 lb. (returns have not yet been received), and from *Noble Five* ore 200,000 lb. In estimating an output of 8,500,000, as included in the foregoing table, it is thought a safe margin has been allowed.

The mining and milling of zinc-bearing ores may be expected to assume important proportions in the future, for there are known to occur in the Province large deposits of ore in which zinc is the chief constituent. While little progress in the metallurgy of zinc-ores appears to have yet been made in British Columbia, the great importance to the Kootenay District especially of solving this problem is recognized, and endeavours are being made to overcome the difficulties now in the way of the general utilization at a profit of the zinc-contents of the ores referred to.

Other Metals.

Very little progress appears to have been made toward the establishment of iron-ore-smelting works in British Columbia, nor has there been, so far as advised, development on a large scale of the deposits of iron-ore known to occur in different parts of the Province.

Coal and Coke.

Preliminary returns received show a gross production in 1912 of 3,066,000 long tons of coal, as compared with 2,298,000 tons in 1911, and 3,139,000 tons in 1910. The quantities made into coke in these several years were: In 1912, about 395,000 tons; 1911, 105,000 tons; and 1910, 339,000 tons. The net quantities of coal—that is, the production on record after deduction of the coal made into coke—were: For 1912, 2,650,000 tons; 1911, 2,193,000 tons; and 1910, 2,800,000 tons. In estimating the net production for 1912, an allowance has been made for a possible slight reduction in the total when the final figures are received. The quantities of coke manufactured in the respective years were as follows: In 1912, 264,000 tons; 1911, 66,000 tons; 1910, 218,000 tons. Of course, all these quantities omit odd figures below thousands. The comparison of gross production as between that of the years 1912 and 1910, respectively, is made for the reason that in the latter year the output was the largest in the history of coal-mining in British Columbia. In this connection it is of interest to note that, notwithstanding that labour difficulties so affected the operation of the coal-mines at Extension and Cumberland, Vancouver Island, during the last quarter of the year as to cause a decreased production from them in 1912 of 107,000 tons as compared with 1911, the net decrease in production of the whole of the Province was but 73,000 tons, so that had it not been for the temporary unfavourable conditions at the mines just mentioned, there is little doubt that the year 1912 would have been a record year in the production of coal.

Reviewing the production in 1912 of the separate districts, it is seen that Vancouver Island mines together made an output of about 1,553,000 tons; those of Nicola and Similkameen, 214,000 tons; and of Crowsnest, 1,299,000 tons. The whole of the 395,000 tons made into coke was from Crowsnest mines, so that the net production of coal in that district was about 904,000 tons.

Taking the figures of value as they now appear in the table of estimated production, it will be seen that the value of coal and coke is less than $10,000 short of being one-third of that of the whole of the mineral production of the Province for last year. Further, a comparison covering the last five-year period, 1908-1912, shows that the proportion of value of coal and coke was 35 per cent. of that of all the mineral production of British Columbia in that period. During the previous similar period, 1903-1907, the proportion was rather less than 26 per cent. These figures indicate the increasing importance of coal-mining as compared with other branches of the mining industry of the Province.

That further expansion of coal-mining operations is intended is manifest, for preparations for increasing the output of coal are already well advanced. Before briefly noticing these preparations it will probably be of interest to have presented a few figures showing the accelerating increase in coal production, especially in quite recent years. The record of coal-mining on Vancouver Island covers a period commencing in 1835. Coal was first shipped from East Kootenay (Crowsnest) mines in 1898, and from the Nicola Valley mines in 1907. Of the aggregate production of approximately 41,143,000 tons of coal (including that made into coke) during the whole period of seventy-seven years, 3,029,000 tons was the total output in fifty years, to 1885, inclusive; 21,255,000 tons in twenty years, to 1905, inclusive; and 16,859,000 tons in seven years, to 1912, inclusive. These figures are of interest as indicating the increased production of recent years—from an average of 1,062,750 tons a year during the twenty-year period above mentioned to an average of 2,408,430 tons a year during the last seven years, which is an increase of a little better than 126 per cent., and this notwithstanding that during recent years labour troubles have affected the output of the Crowsnest District in particular, to an especially marked degree in 1911, in which year there was a total output of only 442,000 tons (gross), as compared with 1,365,000 tons in 1910.

In preparation for enlarging the output of coal, important developments are taking place on Vancouver Island. The Western Fuel Co. is opening a new mine, to be known as Reserve Shaft mine, situated near the mouth of Nanaimo river, on an Indian reserve, distant rather more than three miles from No. 1 Shaft, Nanaimo. The Canadian Collieries (Dunsmuir), Limited, is opening a new mine, No. 8, situated about a mile north of its No. 7 mine, Union colliery, Comox District. This company is also developing hydro-electric power for use at its Union colliery mines, near Cumberland. The Pacific Coast Coal Mines, Ltd., besides continuing the development of its mine at Suquash, in the north-eastern part of Vancouver Island, is opening a new mine to the south of Nanaimo, at a place about one mile nearer to Boat harbour, the company's shipping port for coal from its Fiddick colliery, South Wellington. Production of coal should be commenced in 1913 at all three of the new mines above mentioned. In the Nicola Valley District progress was made at several of the smaller coal properties. Of these, the Inland Coal and Coke Co. was the only one to increase its output—from 11,000 tons in 1911 to 31,000 tons in 1912. The Diamond Vale Collieries, Ltd., suspended mining operations during the greater part of the year, following an explosion, which caused the loss of several lives; work was resumed later in the year. While the output of coal from the mines of the Nicola Valley Coal and Coke Co., the oldest company and the one operating on the largest scale in this district, was smaller than in 1911 (approximately 152,000 tons, as compared with 191,000 tons in 1911), important exploratory work was done, for in prospecting from No. 4 mine a new seam of coal was discovered and afterward its development was undertaken. Much diamond-drilling was also done, and this definitely proved the continuance, over a comparatively large area, of the various seams of coal the company has opened in its several mines. High railway freight charges for transportation of coal to the larger towns are a serious drawback, preventing this company from effectively competing on a large scale with other coal-mining companies more favourably situated. Another railway is being constructed in the district, and it is hoped that this will eventually afford the much-desired relief in connection with freight charges on coal shipments. The Columbia Coal and Coke Co. continued development of its Coalmont property, in the vicinity of Tulameen river, but shipped only about 2,000 tons of coal. The Princeton Coal and Land Co., operating at Princeton, Similkameen,

benefited by the completion of its new coal-handling plant, having a capacity of about 500 tons a day, but long distance from the centres of population and the consequent long freight-haul are a serious handicap to the marketing of its coal, so that it was not practicable last year to considerably increase the output, which is stated to have been about 25,000 tons. In South-east Kootenay the Crowsnest District mines made a good showing, considering that the long-continued miners' strike of 1911 had greatly demoralized the market for coal by largely diverting the trade to United States fields. It is satisfactory to find that, notwithstanding the serious check experienced, coal-production figures for 1912 reached a total only 66,000 tons smaller than that of 1910. The quantities (gross) produced in three successive years were as follows: In 1910, 1,365,000 long tons; 1911, 442,000 tons; 1912, 1,299,000 tons. The coke-production figures have already been given. The Crow's Nest Pass Coal Co., besides continuing operation of various mines at its Coal Creek and Michel collieries, opened a new mine at Coal Creek, known as No. 1 East, developing it to a producing capacity of 1,000 tons a day. In addition, a new seam of coal, above No. 1 seam at Coal Creek, was opened, and at the close of the year there were being made preparations for its permanent development. This company's output of coal from the Coal Creek and Michel collieries was about 963,000 long tons, of which 327,000 tons was made into 220,000 tons of coke. Only ordinary mining and development were done at the colliery of the Hosmer Mines, Ltd., the gross production of coal last year having been 213,000 tons, of which 69,000 tons was made into 44,000 tons of coke. The Corbin Coal and Coke Co. continued its preparations to get out a large quantity of coal from its No. 3 mine, as is called the big deposit of coal opened from the surface at an altitude of 800 to 900 feet higher than the main level into No. 1 mine, from which latter practically all of the coal shipped last year was obtained. To provide transportation facilities for the new mine, eight miles of standard-gauge railway was graded in 1912, and the rails placed in position for seven miles. The coming-on of winter necessitated the postponement for several months of the work of completion of this railway. Already at No. 3 the surface debris has been cleared and stripped over a considerable area, the intention being to work this deposit of coal, proved to be 300 feet across, as an open quarry.

Of new coalfields in various parts of the Province there is little to report so far as concerns probable early production of coal. Little advancement was made in the upper Elk River District toward the utilization of the large quantity of coal in this part of the Province, estimated by D. B. Dowling, of the Geological Survey of Canada, as covering an area of 140 square miles, and containing approximately 14,000 million tons of minable coal. Until railway transportation shall be provided, this important district will remain undeveloped. Neither in the northern part of Cariboo District nor in the North Thompson River country, in both of which coal is known to occur, is there a present prospect of production. Prospecting of coal-measures on Graham island of the Queen Charlotte group has been carried on, and in one instance a comparatively small output is expected for 1913. There is little to be said of coal properties in parts of the lower Skeena District tributary to the Grand Trunk Pacific railway, now in course of construction. Nor has there been much progress in the Groundhog field, near the headwaters of Skeena river.

Structural Materials, etc.

The greater attention given early last year to the gathering of particulars of the production of building materials, etc., confirmed the belief that estimates of the total value of these had been lower than the position amply

justified. Even the comparatively large amount estimated as the value of the production in 1912—$4,250,000—is likely to be found too low, for there has been a general increase in the amount of building, road and sidewalk construction, and other works requiring the use of an enormous quantity of the materials comprised under this head. The various products include building-stone, crushed rock, cement, lime, sand and gravel, and clay products. When returns of the value of the year's output of these materials shall have been obtained, they will undoubtedly show a substantial advance on the total amount—$3,547,000—with which they were credited in 1911.

MINING DISTRICTS OF BRITISH COLUMBIA.

In order to give a general idea of the mineral deposits, mines, and reduction-works of British Columbia, a summary of these, together with an outline of the chief features of the operations during 1912 in connection with the mining and metallurgical industries of the Province, will now be presented. As the mining districts are numerous and cover large area of territory, the information that follows is, necessarily, incomplete, for it is not practicable to deal at length in a general review with all that should have notice. The various districts and their respective subdivisions will here be briefly dealt with and in the order in which they usually appear in the Annual Reports of this Department.

CARIBOO DISTRICT.

Three mining divisions are usually included under the general head of Cariboo District—namely, the Cariboo, Quesnel, and Omineca Divisions. In this district operations are restricted almost altogether to placer-mining: there being little, if any, other productive mining. Doubtless this extensive area possesses great potentialities in its undeveloped lode-mineral resources, and in much smaller degree, perhaps, in coal, but the fact that heretofore it has been entirely without railway transportation facilities has been an effective bar to the utilization of those resources. However, railway-construction is in progress through the extreme northern portion of the district, and there is a reasonable probability of similar work being undertaken before long to make the central and southern parts easily accessible for heavy traffic, so the outlook is now encouraging to a greater extent than previously.

Mention has already been made of the exceptionally dry nature of the 1912 season, and the consequent result it had in the direction of preventing a large recovery of gold. However, those who are engaged in hydraulicking are persevering in their preparations for extending their operations, so it is expected the yield of gold will be proportionately larger in the 1913 and following seasons.

Cariboo Mining Division.

Not much information has yet been received concerning last season's work and results on individual properties, but it is known that the several hydraulic mines on Williams creek and its tributaries—namely, the *Louchoe*, *Stout's Gulch*, *Forest Rose*, and *Mosquito Creek*—were again worked by John Hopp.

The company known as the West Canadian Deep Leads, Ltd., has been working on Little Valley creek, but until the official report of the Gold Commissioner for the district is received, particulars of the work done will not be available. The position is a similar one in regard to operations on Lightning creek and its tributaries. The various companies who have been mining on these and other creeks in this division are the Lightning Creek Gold and Gravels Drainage Co.; the Lightning Creek (British Columbia) Hydraulic Mining Co., Ltd., working the *South Wales* ground; the Venture Mining Co., on Peters creek; the Wormwold Creek Mining Co., on Wormwold creek; the Four-Leaf Clover Hydraulic Mining Co., on Perkins gulch; the Copper Creek Co., on Sugar creek; the China creek, Nugget gulch, Waverley, Stewart creek, Last Chance creek, and others.

Quesnel Mining Division.

The most important mining-work done in Quesnel Division in 1912 was that of the Quesnelle Hydraulic Gold Mining Co., which commenced preliminary hydraulicking operations in August, 1911, and after a run of nearly three months stopped work on November 7th, cold weather having suddenly set in. No clean-up was made, so no gold-recovery was reported for that year. The then newly completed water-supply system was found quite satisfactory in working. Water is brought from Swift river a distance of twenty-five miles. Beside the long ditch-line, there are three inverted siphons. The flow of water has been as much as 60,000,000 gallons (about 4,000 miners' inches) in twenty-four hours. The wear of the diorite blocks or boulders with which the sluiceway was lined in 1911 having proved excessive and maintenance cost proportionately high, before the 1912 hydraulicking season opened the sluice was paved with high-carbon steel rolled plates, containing from 0.80 to 1.20 per cent. carbon, and of dimensions of ½ inch in thickness and 58 inches square. At the end of that season it was ascertained that these high-carbon steel plates gave even greater efficiency than had been expected, both in regard to duty obtained and the absence of any appreciable amount of wear. From the rate of wear—or, rather, lack of it—the conclusion is that they will stand at least 20,000,000 yards of gravel being passed over them before they will be worn out. The season's experience with these plates was in striking contrast to that of the previous year with ordinary wooden blocks which lasted only a few days, while diorite boulders wore as much as 8 inches in three weeks. No trouble was experienced by sand packing under the plates, which so evenly distributed the gravel over the full width of the sluiceway that there was no tendency to wear in the centre of the plates, such as was experienced with steel rails. The plates may be used for gold-saving by separating them for about 2 inches and allowing each succeeding plate to be lower in level about ½ inch, to avoid excessive impact of the boulders moving from one plate to another. This arrangement was found much superior to placing the plates end to end, which latter plan naturally would be used so as to provide a continuous smooth surface. As plates so nearly 5 feet square provide for a riffle only every 5 feet, it is considered advantageous to place rails at the head of the sluice for such a length as to ensure the recovery of the gold. The rails used here were of rolled manganese-steel, but it was seen that, although their wear was much superior to that of ordinary steel, their life will be only a small fraction of that of the plates, so their use cannot be recommended except for gold-saving purposes. Illustrations of these plates and rails were given in last year's Report. The cost of operating (including all actual mining expenses, but no interest or amortization charges) was stated to have been reduced to 2 cents per cubic yard of the material handled. This was just one-half of the previous season's cost, which great reduction was due almost entirely to the use of the steel plates, for it allowed of the working force being reduced in number from forty to twenty-two men for mining 9,000 yards of gravel a day. It is believed that in next season's operations a further reduction will be made to even lower than this low cost. As a result of last season's operations, the position of the main pay-channel of the ancient river system on which work is being done was ascertained. This system has been definitely traced for approximately three miles, and it is about one mile in width. The season's work, through the amount of gold recovered, determined the situation of the main part of the channel, so that it is thought there need be no question as to the proper place for the construction of the main sluiceway next season.

The hydraulic installation practically completed in 1911 by the late John B. Hobson was in use in 1912, but, as there was much more preliminary work to do in opening the new pit than had been expected, it is probable the recovery of gold there was small. Beside this mining on Spanish creek, there was also work done on the North fork of Quesnel river, and on Keithley, Snowshoe, Martin, and other creeks, but details have not been received.

Omineca.—While attention is again being given to placer-mining on the Omineca river, and preliminary work was done there last season, it is unlikely that operations were far enough advanced to have resulted in the recovery of much gold.

General.—Construction of new roads and trails in various parts of this big district has had the active attention of the Provincial Government, so that additional facilities for travel have thus been provided. Means of communication will be greatly improved when several of the proposed railways have been built. It is probable that much railway-construction work will be undertaken during this year and next.

CASSIAR DISTRICT.

The extensive area known as Cassiar District includes the following mining divisions: Atlin, Liard, Stikine, Skeena, Queen Charlotte, and Portland Canal. As yet, there is comparatively little mineral production in this large district other than that of placer gold in the Atlin Division. Revised figures for 1911 showed Atlin's proportion of the district's total of $268,442 to have been $228,776, of which $225,000 was for placer gold. However, developments taking place indicate that a similar disproportion will not be continued, for Skeena may be expected to soon commence producing lode metals, even if the mining of coal be longer deferred. The approaching completion of the Grand Trunk Pacific railway through the greater part of the Skeena river and the Bulkley Valley country will provide needed transportation facilities, and the mining and shipment of metalliferous minerals on a commercial scale may be expected to be undertaken during 1913. Productive coal-mining, however, is likely to be postponed at least another year.

Atlin Mining Division.

As has already been mentioned, there was experienced in Atlin Mining Division in 1912 an unusual shortage of water for placer-mining operations, and consequently less mining-work was done than would have been under favourable conditions. Notwithstanding this drawback, however, it is estimated that more gold was recovered than in the 1911 season—about $250,000 last year, as against $225,000 in 1911. Placer-mining was done on the following streams: Pine, Spruce, McKee, Birch, Boulder, Ruby, Wright, Otter, Wilson, Lincoln, and Davenport creeks, and O'Donnell river.

The North Columbia Gold Mining Co., of which J. M. Ruffner is general manager, is reported to have been somewhat handicapped by an inadequate supply of water, so that the season's results were not quite as good on the whole as in 1911, though in one of the pits worked by this company more gold was recovered than in any previous season. An increased yield from Spruce creek is estimated, notwithstanding that fewer mines were worked there than in other years. A substantial increase is thought to have resulted from operations on Ruby creek, on which hydraulicking was done in ground known to be rich, but not previously reached when gravel-washing. On several of the other creeks above mentioned insufficiency of water led to smaller returns in gold. On the three streams last on the list prospecting only was done, in each case with encouraging results.

New discoveries of placer gold were reported to have been made, respectively, on the benches of O'Donnell river and on four creeks south of Teslin lake. Much new ground on the former stream was staked in claims and leases, while the gold that Indians showed in Atlin as having been found by them near Teslin lake led a number of white men to proceed to investigate, although it was late in the season when news of the Indians' discovery was made known.

Quartz-mining had little attention except on Taku arm, where further prospecting and development were done on both the *Northern Partnership* (formerly the *Engineer*) and *Ben McChree* groups. A small quantity of very rich quartz was taken from the former.

Skeena and Portland Canal Divisions.

The most important mining developments of the year in the Skeena Division were those of the Granby Consolidated Co. in the vicinity of Granby bay (formerly known as Goose bay), on Observatory inlet. This company's *Hidden Creek* mines, on Alice arm of the inlet, were described in the last Annual Report of this Department. During 1912 much progress was made in the further development of the mines and toward providing the considerable surface equipment requisite for working the property on the extensive scale for which financial provision has been made. Briefly, it is claimed by the company's representatives that underground developments have already proved the occurrence there of between 5,000,000 and 6,000,000 tons of ore having an average copper-content of between 2 and 3 per cent., and that diamond-drilling warrants the belief that as much more ore will be developed later. A liberal appropriation has been made by the directors of the company for continuation of underground work, while the carrying-out of surface works is already well advanced. The latter include dam, pipe-line, power-station, and transmission lines for a hydro-electric power system; copper-smelting works, to have a capacity of 2,000 tons per diem; railway for transportation purposes between mines and smelter and shipping dock; construction of dock and erection of many buildings, and much complementary work. Grading has been done, materials got together, contracts for the supply of machinery and plant entered into and arrangements well advanced for the establishment at Granby bay of an important copper-mining and smelting plant.

The Granby Co. has also been doing development-work on the *Bonanza* group, situated not far from the *Hidden Creek* mines. Several other properties have had work done on them, but, as a rule, operations on the latter were of comparatively small importance.

In the Portland Canal Division, the more prominent features of the year were the shipment of about 1,261 tons of copper-ore from the *Red Cloud* mine, the commencement to drive a 2,000-foot low-level adit to prospect at depth a group of claims on Glacier creek, and the encouraging results of work done in the Bear river-Cascade creek part of the division, where the *Indian Mines*, *Cascade Falls*, and *Red Reef* properties were being developed.

Omineca Mining Division.

Unofficial reports are to the effect that additional development done in 1912 on some of the mineral claims on Nine-mile and Glen mountains has resulted in the respective owners making provision for doing more work, and in one or two instances for power equipment to facilitate underground work. Not having railway connection early in the year, the shipment of ore was not practicable, so that, with the exception of a trial shipment from the *American Boy*, commercial production has not yet been commenced.

Other camps in this division are those of Rochers Deboules mountain, Four-mile mountain, Babine range, Hudson Bay mountain, Kitsalas canyon, and Zymoetz river. As a rule, though, only development was done in these several camps.

There was no considerable addition to the yield of placer gold from rivers and creeks in this division, though on some of these much test-work was done with a view to engaging in placer-mining where there is sufficient encouragement to do so.

There is not much that is new to add to the reports on coal in the vicinity of Hazelton, or in the newly prospected field north of Groundhog mountain, included in the Annual Report of the Minister of Mines for 1911, although development-work has been actively carried on.

Other Mining Divisions.

Little information has been received from Liard and Stikine Divisions, in which placer-mining on several creeks, and the development of the mineral claims of the Iskut Mining Co. on Iskut river, constitute most of what little there has been done in these outlying divisions.

On Thibert Creek, in the Liard Division, there has been work going on all season; the Boulder Creek Mining Co., having taken over the leases on that creek formerly held by the Thibert Creek Mining Co., has been engaged all summer in opening a new pit, about a mile down-stream from the old Thibert Co.'s pit, in which so much difficulty was met from mud-slides.

The new pit should be free from such troubles, as it has a well-defined rim-rock; it has also ample dump and a short sluiceway to the river, while tests of the gravel indicate a sufficiency of gold.

The flume was continued from the old to the new pit and water turned on in July, but the summer was chiefly taken up with opening the new pit, and so but a small output was made.

Of Queen Charlotte islands, also, no record for the year has yet been received, but so far as is known the chief activities have been boring for oil and coal and the further development of coal-measures on Graham island of this group, and more work on mineral claims on Moresby island. Some coal-handling facilities have been provided by one company for the purpose of shipping coal, but very little output has yet been made.

EAST KOOTENAY DISTRICT.

The value of the mineral production of the East Kootenay mines in 1912 will probably be found, when the returns have been received, to be more than twice as much as that of 1911. This will be accounted for by the fact that last year there was not any serious interruption to the production of coal and coke, such as caused the large decrease in the output of 1911. The adverse effect the suspension of production in 1911 had upon the market for Crowsnest coal has already been mentioned; with this in mind, it is not surprising to find that the figures for 1912 show a smaller production than in 1910, this involving a decrease in the total value for the year of about $150,000. As the value of metalliferous mineral production is estimated to have been also smaller, by about $350,000, it follows that the total decrease in 1912 as compared with 1910 was something like $500,000. However, it is gratifying to find that the recovery was so large, for last year's total value appears to have been about $5,000,000, as compared with $6,122,000 for 1910, and $2,475,000 for 1911. This is assuming that there was no appreciable increase in the total value of the metalliferous mineral output in 1912; it may be, however, that final returns will show that this assumption takes too conservative a view of the situation.

The production of coal and coke in this district has already been briefly noted. In passing, it may be mentioned that in value it was $4,901,000 in 1910, $1,408,000 in 1911, and about $4,750,000 (estimated) in 1912.

As to metalliferous mining, the yield of placer gold from East Kootenay streams has again been placed at $3,000. The total output of lead and silver from the lode mines does not appear to have shown much change; though there is a probability of final figures proving that there was an increase of 35,000 to 40,000 oz. of silver, which, together with a higher average price for the year, should add $40,000 or thereabouts to the value of the year's production of this metal in this district. The productive mines were the *Sullivan*, *St. Eugene*, *Monarch*, and *Society Girl*—the last in but small quantity. Complete returns are not yet available, but it is probable that the receipts at the smelter from the respective mines were about as follows:—Crude ore: From the *Sullivan* 31,900 tons, and the *Society Girl* less than 100 tons. Concentrate: from the *Monarch* (situated near Field, North-east Kootenay) 1,200 tons, and the *St. Eugene* 1,100 tons.

The construction of the Kootenay Central railway by the Canadian Pacific Railway Co. was continued throughout the year—southward from that company's main line at Golden, and northward from its Crowsnest line east of Cranbrook. Late in the year a train service between Fernie (on the Crowsnest line) and Fort Steele was inaugurated, while freight was sent over a length of the line completed from Golden southward. There was no ore shipped from mines along the route of the new railway.

WEST KOOTENAY DISTRICT.

The West Kootenay District has long been one of the most important in the Province in regard to the production of metalliferous minerals, though latterly in both quanity of ore mined and total value of metals produced it has been made to take second place by the Boundary District. The metals produced from its mines are varied—gold, silver, lead, copper, and zinc. Its chief mining camp is Rossland, in the Trail Creek Mining Division, with Slocan, Nelson, Ainsworth, and Revelstoke-Lardeau Divisions following, in the order given, in value of production.

Ainsworth and Slocan Divisions.

In the Ainsworth Division, work was resumed about February 1st at the *Bluebell* mine, situated on the east shore of Kootenay Lake. Part of the lower ground of the mine was developed and the continuance of the ore below the lake-level proved. A new main shaft was opened and a hoisting and ore-crushing plant put in, while a new compressor gave additional power. The concentrating-mill was also improved. Some 33,000 tons of ore was milled and about 50,000 oz. of silver and 4,000,000 lb. of lead recovered. In the old Ainsworth camp, the *No. 1* and *Silver Hoard* both shipped ore, the former about 600 and the latter 200 tons. The Consolidated Mining and Smelting Co. constructed an aerial tramway from the *No. 1* down to the *Highland* mill on Kootenay lake. A remarkable cave was opened on the *Silver Hoard*, which proved useful for prospecting part of that mine. Development-work was continued on several properties in the Poplar Creek camp. Little progress was made on the South fork of Kaslo creek, but ore was shipped in fairly large quantity from both the *Utica* and J. L. Retallack & Co.'s *Whitewater* mine, while development-work was done on both, as well as the *Deep* mine of the latter group. Railway communication was restored to Whitewater, by extension from Three Forks. Small shipments of ore were made from the Florence Co.'s *Hope* mine and the *Panama*, and work was done on the *Eureka*.

The development of the *Lucky Jim*, in the Slocan Division, was continued, and after the completion of the railway from Three Forks, shipment of ore was resumed. The opening of the *Rambler-Cariboo* mine on several levels down to the 1,400-foot, inclusive, was pushed on, most work having been done in the deep. An aerial tramway was constructed between the mine and the new mill on Seaton creek; the mill equipment was added to, a capacity of 75 tons in two shifts being provided for. Railway transportation was arranged for by making a spur to the mill, at which operations were commenced late in the year. About Sandon, shipment of ore was made from both the *Ruth-Hope* and *Richmond-Eureka* groups; a deep-level adit was driven to cut the big vein on the *Slocan Star*, and similar important underground work well advanced on the old *Payne* property. In the vicinity of Cody, shipment of high-grade silver-zinc ore from the *Deadman* mine of the *Noble Five* group was commenced; the long raise was completed from the extension of the *Last Chance* No. 3 adit up to the old workings of the *Surprise*, and shoots of good ore opened on the two lowest new levels; and more development-work was done on the *Reco*, *Sunset*, *Colonial*, *Noonday*, and *Mountain Con*. Near Three Forks, the *McAllister*, *Lone Bachelor*, *Cinderella*, and *Silver Ridge* were worked, and above Alamo the *Idaho-Alamo* mines were further developed with good prospects of again becoming important producers. In the neighbourhood of Silverton, at the *Standard*, *Van-Roi*, and *Hewitt-Lorna Doone* gratifying progress was made, especially at the first mentioned of these mines. Owing to the destruction by fire of the *Wakefield* concentrator, the Silverton Mines, Ltd., which had been using it, was unable to continue the production of much ore, but the erection and equipment of a new mill was undertaken, and arrangements made to use in this a flotation process as auxiliary to water-concentration. The *Standard* shipped about 4,400 tons of first-class crude ore, and the mill product of nearly 33,000 tons of second-class ore—namely, 5,400 tons of silver-lead and 3,300 tons of silver-zinc concentrates; the metal contents of all products shipped were—silver, 832,000 oz.; lead, 12,440,000 lb.; and zinc, 2,706,000 lb. Large bodies of good ore were opened in the mine. The *Van-Roi* milled about 54,000 tons of ore, shipping products of which were nearly 2,400 tons of silver-lead and 2,600 tons of silver-zinc concentrates; metals produced were—silver, 586,000 oz.; lead, 3,070,000 lb.; and zinc, 2,849,000 lb. Several new and valuable ore-bodies were discovered in this mine. The Silverton Mines, Ltd., found the south vein on No. 4 level of the *Hewitt-Lorna Doone* mine, and made ready to commence driving Nos. 8 and 9 levels to cut both the main and south veins at a total depth from the apex of between 1,600 and 1,700 feet. The British Columbia Copper Co. continued development at the *L.H.* mine, situated in the mountains south-east of Silverton, and opened much low-grade gold-ore there.

In the Slocan City Division, on Ten-mile creek, work was done at the *Enterprise* and *Eastmont* mines, and some ore shipped. Lower down in Slocan Lake District, the *Meteor*, *Black Prince*, and *Lily B.* were worked, while on Lemon creek gold-ore was shipped from the *Zilo* and crushed at the old *Chapleau* mill. In addition, work was done on several other properties in this division.

Nelson Mining Division.

The most important features of the year in the northern part of the Nelson Mining Division were the respective operations of the Consolidated and British Columbia Copper Companies. The former did much underground development-work and made many surface improvements at the *Molly Gibson* mine, from which between 2,000 and 3,000 tons of silver-lead ore and concentrate was sent to Trail; late in the year the company arranged to acquire

a three-quarter interest in the *Silver King* and *Dandy* groups, near the town of Nelson, and prepared for doing development-work on them. The B.C. Copper Co. bonded the *Eureka* and purchased the *Queen Victoria* mine, both situated within a few miles of Nelson; development of the former and shipment of ore to Greenwood from the latter were in progress during part of the second half of the year. The *Granite-Poorman* gold-mines and stamp-mill were operated as usual. In the eastern part of the division, the La France Company continued development-work on a promising silver-lead property situated in the mountains east of Kootenay lake.

In the Ymir camp, the *Yankee Girl* group was bonded by the Mabry Syndicate, Spokane, Washington, and shipment of ore was resumed in the latter part of the year; development of the *Wilcox* was continued; the long low-level adit on the *Dundee* was further extended, and work was also done on other properties in this camp. Near Salmo, the *Emerald* shipped about 1,700 tons of ore containing 1,300,000 lb. of lead and 2,200 oz. of silver, put in a compressor plant which with buildings cost about $9,000, and did much development-work, including driving a crosscut tunnel to reach the ore at 585 feet depth. The *H. B.* shipped something like 700 tons of lead-silver ore to Trail and did more development-work.

The producing gold-mines in Sheep Creek camp were the *Queen* and *Mother Lode*. No information was received concerning the former, but it is probable that an average of about 50 tons of $10 ore was milled daily. The *Mother Lode* production during four months, July-October, was approximately 7,800 tons crushed; value of product about $102,000, to which must be added results for November and December. Several other properties in this camp made small shipments to Trail. At Erie, the *Arlington* shipped more than 1,000 tons of gold-ore; from May 1st this mine was worked on lease by W. J. Barker, formerly superintendent. No particulars were obtained of what was done at the *Second Relief*.

Trail Creek Mining Division.

The information received relative to Rossland indicates a position not at present accounted for—namely, that authoritative statements show more ore has been developed in the larger mines than in several recent years, yet the total output of ore and, consequently metals appears to have been less than in either 1911 or 1910. Official records show that in 1910 the output of ore was 254,000 tons, and in 1911, 255,000 tons, yet figures for 1912 received to date make it appear that the quantity for 1912 was only about 245,000 tons, and this notwithstanding that average prices for silver and copper were much higher last year, while gold, the chief product of the Rossland mines, of course remained the same price as in other years. Doubtless there is a satisfactory explanation that will be made later. Meanwhile the following statements may be accepted as thoroughly reliable: The year's developments in the Consolidated Co.'s mines have been very satisfactory, especially so in the lower levels, where large bodies of ore of very good grade have been opened. The quantity of ore developed is larger than for some time past, and the average grade considerably better. Development-work has been extensively done—in the *Centre Star*, 4,726 feet; *War Eagle*, 5,621 feet; and *Le Roi*, 4,375 feet; total, 14,722 feet. Diamond-drilling in those mines, respectively, was 4,221 feet, 5,475 feet, and 10,563 feet; total, 20,258 feet, and the approximate quantity of ore shipped, 208,000 tons. In the mines of the Le Roi No. 2, Ltd., besides discoveries of numerous ore-bodies in the better-known veins in the upper ground, the most important development was that of an ore-body on the 1,650-foot (*Le Roi*) level. This is the deepest ore known in the ground

of the *Le Roi No. 2;* its metal contents, size, and character are all good, so it augurs well for the future of that part of the company's property. Further development is in progress there. Total of development-work done in 1912 is 6,115 feet, and of diamond-drilling 14,185 feet. Out of a total of 57,670 tons of material moved, there was sorted 35,000 tons of ore, of which 18,000 tons was shipped crude and 17,000 tons milled, the product of the latter having been 1,658 tons of concentrate.

Shipments from the smaller mines also show a decrease. In the South Belt of Rossland camp the developments on *Blue Bird* and *Phoenix* were encouraging, with good ore opened in each mine. At the *Inland Empire*, situated in the western part of the division, the operation of a 10-stamp mill was commenced in the autumn.

Smelting and Refining.—Many changes and improvements were made at the Consolidated Co.'s smelter and refinery at Trail. The whole of the extensive Huntington-Heberlein converter plant was remodelled, the changes made having ensured more expeditious, effective, and economical handling and treatment of furnace products, and better working conditions for the convertermen. The method formerly in use for roasting and converting the matte made by a first concentration has been superseded by a pyritic concentration. Improvements were made in handling ores from the stock-yards to the furnaces, and in bedding lead-ores; in provision of motors for collecting and hauling the charges to the lead-stacks, and for hauling matte-cars, instead of tramming cars and drawing pots by hand; in the abolition of platform elevators and substituting for them graded tracks from level to level of the works; in putting in a matte-crushing plant, pan-conveyor, and steel matte-bins; in the addition of more machine tools and other appliances to the mechanical equipment; and in enlargement of the electrolytic refinery so as to refine 30 tons more lead a day, thereby increasing the daily capacity to about 100 tons. A number of electric traction lines and tunnels have been constructed throughout the works and in places belt-conveyors put in, to facilitate the handling of ore, coke, matte, bullion, and other materials. In addition to all these improvements to the plant at the smelter and at the various mines, the company also declared a dividend of $232,176.

Other West Kootenay Divisions.

Comparatively little mining was done in the other divisions of West Kootenay. In the Big Bend of the Columbia District, Revelstoke Division, more attention was given to placer-gold mining on French creek, following the recovery of 40 to 50 oz. of gold by L. N. Remillard. Smith, Eight-mile, and Camp creeks also attracted notice, so that more placer-mining than for several years is expected to take place on those streams next season.

There was some lode-mining in Trout Lake Division, the *Silver Cup* having sent out about 340 tons of silver-lead ore, while the *Ajax* and *Nettie L.* mined a little—less than 100 tons each—and the *Lucky Boy* shipped a car-load. Development done on the *Noble Five* group encouraged the owners to continue work. The *Broadview* and others were also worked, but there was little ore shipped.

BOUNDARY DISTRICT.

The Boundary District, the mines of which together produce more copper than those of any other part of Canada, led in 1912 in British Columbia in respect of both the quantity of ore mined and the total value of metals produced. The ore-output of the mines in the Greenwood and Grand Forks Divisions exceeded 1,900,000 tons, as compared with 1,187,000 tons in 1911, and 1,654,000 tons in 1910. (It will be remembered that the strike at the

Crowsnest collieries adversely affected production in 1911.) It is customary to include the production of Osoyoos Division with that of the others above-mentioned, but, leaving that out for the present, a rough approximation of the output of metals from Greenwood and Grand Forks Divisions in 1912 is as follows: Gold, 68,000 oz.; silver, 380,000 oz.; and copper, 33,000,000 lb. For statistical purposes there will be added about 37,000 oz. of gold from the Hedley Gold Mining Co.'s mines in Osoyoos Division. The total value of the output (including $760,000 from Hedley) was approximately $7,750,000, which constitutes a record for the year as compared with that of metalliferous minerals from other districts in the Province. It will not, however, be as high as the Coast District for total value of all mineral production, for there coal and structural materials reached a total value in 1912 of about $9,000,000, in addition to between $2,000,000 and $3,000,000 for metallic minerals.

Granby Consolidated.—The Granby Consolidated Mining, Smelting, and Power Company, Ltd., in 1912 mined and smelted about 1,240,000 tons of ore from its own mines in Phoenix camp. This compares with 606,000 tons in 1911 and 1,075,000 tons in 1910. It is claimed that as much new ore was developed during the company's last fiscal year as was shipped to its smelter, and that there is still in the mines between 6,000,000 and 7,000,000 tons of minable ore "estimated in sight." Development-work in the company's mines was carried on as usual; the total for the year was rather more than 11,000 lineal feet of drifts, crosscuts, and raises. Diamond-drilling runs to about 1,000 feet a month when in full operation, and the cost of this is put down as adding to development costs about 14 cents, bringing mining costs up to about 78 cents a ton of ore mined. Much of the drilling is done in new territory outside of the sphere of present mining operations, with the object of finding new ore-bodies. In the early summer of 1911 a map was prepared of an area to be systematically drilled, and the positions of drill-holes determined upon. Drilling has since been steadily prosecuted, the intention being to continue this work until the whole area has been explored.

At the company's big smelting-works at Grand Forks, an important change made was in the method of disposal of the slag—from hauling it out to the dump molten in trains of slag-pots, to granulating and elevating, by belt-conveyors, to a height of 100 feet, thus forming a new dump on top of the old one. The new system has been successfully developed, and late in 1912 a second set of trestles and belt-conveyors was put in for use in case of interruption of that used throughout the year. The smooth and successful working of the company's blast-furnace operations will be indicated by mention of the fact that all the eight furnaces were run continuously from June 5th to November 9th, a period of 156 days, this constituting a record run for the whole battery at the works. Apart from this, there was very little interruption to the running of the furnaces or the converting plant at any time through the year.

In his report for the company's fiscal year ended June 30th, 1912, the superintendent of the smelter included the following information: "Average smelting cost for the year was $1.256, as against $1.172 for 1911 and $1.187 for 1910." (NOTE.—Tonnage of ore smelted was: To June 30th, 1912, 739,519 tons; 1911, 984,346 tons; 1910, 1,183,624 tons.) "The last five months, leaving out the months when high-priced (Pennsylvania) coke was used, show fairly well, being $1.20. The ores were more silicious this year than last, and slags were higher in silica. The copper loss was less than in any previous year. . . . Smelting and converting the last five months were $1.264, being 0.024 cents less than 1911, and the lowest yearly costs the Granby Co. has ever made. Average cost of smelting and converting was $1.34, and loss of

copper in slags was 4.2 lb." It should be remembered that labour troubles at the collieries caused a suspension of smelting for between four and five months in the latter part of 1911, so that several weeks of 1912 passed before conditions became normal.

B.C. Copper Co.—The British Columbia Copper Co., Ltd., also had an active and successful year. Exact statistics have not been received, so those that follow must be regarded as approximate figures for December operations having been estimated. The company's chief sources of ore-supply are its *Mother Lode* mine, near Greenwood, and the *Rawhide* mine, near Phoenix. The latter is owned by the New Dominion Copper Co., but since the B.C. Copper Co. possesses a controlling interest in the New Dominion Co. and works its mines, the several properties may be referred to as if owned by the same company.

Of a total of 687,000 tons of ore received at the company's smelter from its mines, the *Mother Lode* sent 384,000, the *Rawhide* 267,000, the *Wellington Camp* group 11,000, the *Emma* 4,500, and the *Queen Victoria* (Nelson Division) about 1,000 tons, while the remainder was from the *Lone Star* and *Napoleon* mines, the last two being situated south of the International Boundary-line, in the adjoining State of Washington. Leaving out of account the metals in ores from the United States, the recoveries were, approximately: Gold, 23,200 oz.; silver, 119,000 oz.; copper, 11,102,000 lb.

At the *Mother Lode* mine the year's work consisted chiefly of drilling in advance of breaking down pillars and benches of ore, and this drilling was kept far ahead of ore-breaking requirements, preparatory to blasting with electric-fired charges. The method followed was to drill and load from 1,500 to 2,500 holes, averaging about 12 feet in depth, and connect them up in groups of twenty-five to a group. All were provided with electric fuses and fired simultaneously. Each of these blasts broke down many thousand tons of ore, in some cases enough to last for shipping during several months. Fire so badly damaged the power plant at the *Emma* on February 27th that no work has since been done in that mine. The *Wellington* group mines were worked until June, but not since; it is planned to do much exploratory work on this property next season. As there is a large quantity of ore available in the company's *Lone Star* mine, the ore of which is very silicious, concentration tests were made to determine the best way to eliminate the excess of silica, and this problem is now in a fair way toward being solved.

The only one of the New Dominion Copper Co.'s mines that was operated on a large scale in 1912 was the *Rawhide*, situated near Phoenix. Development-work consisted of some 2,650 feet of raises and drifts. Included in the new work was a branch of the lower tunnel, connecting with the ore-shipping bins; the total of ore shipped has already been stated. An electric haulage system was put in, to take the place of hauling with horses.

Early in July the company's general manager, Edward G. Warren, met with an automobile accident, which resulted fatally. He was succeeded by Frederic Keffer as acting general manager.

Other Mines.—Little or nothing was done in 1912 by the Consolidated Co. at its mines in the Boundary District—the *Phoenix Amalgamated* group and the *No. 7*. A small shipment of ore was made from the *Elkhorn*, near Greenwood, and tunnel-driving was continued on the *Argo*. The *Jewel* stamp-mill was operated during the last quarter of the year and some $15,000 worth of precious metals recovered. Development of coal-measures in the Kettle River valley near Midway was continued. There was but little mining done in the country along the West fork of Kettle river, but now that a railway has been constructed to that part of the Boundary District several small high-grade mines there should be worked.

SIMILKAMEEN DISTRICT.

Hedley Gold Mining Co.—The only important metal-mining done in this district was that by the Hedley Gold Mining Co., owning a group of gold claims situated in the mountains a few miles from Hedley, and operating a 40-stamp mill and auxiliary cyanide plant at that town. Development-work done in the company's *Nickel Plate* mine included sinking a shaft from No. 4 level to a depth of 400 feet, opening three levels from it, and drifting 300 feet, all in ore. A raise was made 300 feet to connect No. 4 level with workings above, also in ore. All other development was in the ore-body; none was done in the *Sunnyside* mine. Diamond-drilling totalled about 3,450 feet, of which about 2,000 feet was done by contract and the remainder by the company with its own drill. The approximate total of ore mined and milled was 70,000 tons; value recovered $762,700, or a recovery of nearly $11 a ton. Of the amount, about $650,000 was in concentrates and remainder cyanide bullion. Expenditures totalled somewhere near $355,200, so profit was about $407,500. Corresponding figures for 1911 were: Ore milled, 57,815 tons; receipts from same, $679,616; expenditures, $370,814; net profit, $308,802. Dividends paid in 1912 totalled $360,000, being 30 per cent. on the issued capital of $1,200,000; in 1911 $300,000 was paid, equivalent to 25 per cent. The company lately purchased the *Windfall* group of mineral claims; the price has been stated as $150,000.

Voigt's Camp.—The British Columbia Copper Co. did much development-work on two groups of mineral claims, held under option of purchase, situated about ten miles south of Princeton. The larger group, known as *Voigt's*, contains fifty-five claims; the smaller includes eight claims having individual owners. Development-work was commenced in October, 1911, and carried on continuously until December, 1912. Six diamond-drills were used and many thousand feet of drilling was done on the *Voigt* group, and, in addition, about 1,500 feet of underground hand-work and several thousand feet of surface trenching. Work was stopped in December, but no information was then made public as to the company's intentions—whether or not it would make the large payment falling due under the bond. Some 700 feet of underground development and 1,500 feet of diamond-drilling was done on claims in the "upper camp," which adjoins the *Voigt* group on the south; the first payment under the bond on these claims has been made.

The ore met with in this camp varies, as a whole, from heavy hæmatite containing copper and iron sulphides with gold and silver, which ore is base, to ore containing a high percentage of silica with similar economic minerals. The geological features of the camp have not yet been thoroughly worked out, but as a rule the tendency of mineralization is along fracture zones extending in a general direction from the south-west toward the north-east, the surface mineralization being extensive. Details concerning the ore-bodies, however, have not yet been made known.

Princeton Coal Co.—The Princeton Coal and Land Co., operating a coal-mine at Princeton, completed its new coal-handling plant, which, though not a large one, is one of the most complete and efficient in the Province. When additional railway transportation facilities, now being provided, shall be available, a much-increased output from this company's colliery is looked for.

A very small quantity of coal was mined at a place a few miles east of Princeton. At the Columbia Coal and Coke Co.'s Coalmont property, situated between Granite creek and Collins gulch, back from Tulameen river, a commencement was made to mine coal. Some 5,800 tons was taken out, and, the railway having been extended from Princeton to Coalmont, a distance of about

fifteen miles, shipment was made of 2,000 tons. Development of the coal-measures on this property is being continued.

NICOLA VALLEY.

The metalliferous mineral deposits of the Nicola Valley District remain undeveloped, except that assessment-work is done on numbers of mineral-claims for the purpose of retaining the right to them. No recent information has been received relative to the deposit of gypsum reported as occurring here. The development of coal-deposits in Nicola valley was continued. Progress was made with the construction of a second railway, which it is hoped will be of much benefit to the coal-mining interests of the district by affording communication with centres of population only now accessible by roundabout routes.

Nicola Valley Coal Co.—While, owing to the lack of railway competition, this company has not yet been able to take full advantage of markets for its product to which it could ship freely under less unfavourable freight conditions, it has up to date mined 600,000 tons of coal. Its management is much encouraged by the results of diamond-drill explorations and actual mining done, for these have demonstrated that large deposits of coal occur on the company's property. The mines are well and adequately equipped for a much larger production than has yet been made. While, however, its market for screened coal has been steadily increasing, the profitable disposal of the slack has been a serious problem. It is quite likely, however, this difficulty will be overcome, for experiment has shown that coal from the company's mines is well suited for briquetting, and investigations as to a market for such briquettes as can be made here indicate that there is a large demand for that kind of fuel.

Other Coal Properties.—The Diamond Vale Collieries, Ltd.; Inland Coal and Coke Co., Ltd; and the Pacific Coast Colliery Co. of British Columbia are owners of other coal properties in this district, but no information besides that given earlier in this review has been obtained of their operations in 1912.

KAMLOOPS AND YALE.

There does not appear to have been much mining of importance done in 1912 in the Mining Divisions of Kamloops, Ashcroft, and Yale.

In the Kamloops Division the development of several copper properties was continued, and reports were published of finds of placer-gold. The construction of the Canadian Northern Pacific railway, now in progress, may be expected to lead to more work being done to develop the coal-measures occurring in the valleys of the North Thompson river. Little has been heard of the mineral claims in Seymour Arm camp, which is at a disadvantage in not being near a railway.

A little placer-mining is still done on streams in the Yale Mining Division, and a number of mineral claims are being prospected, but no noteworthy developments have been reported.

LILLOOET.

As was stated in the last Annual Report of this Department, the Provincial Mineralogist's account of his trip through Lillooet, printed in the Annual Report for 1910, caused much attention to be given to the district. Though now better off in this respect than in earlier years, the district still requires better transportation facilities. The construction of a railway from the head of Howe sound through the district and thence to Cariboo and Fort George has been undertaken, so that advantage will later be derived from that improvement in conditions.

Placer-mining for gold was carried on in several parts of the district, but operations were not large in 1912. Mining operations have been chiefly confined to the upper Bridge river section, near Cadwallader creek, at the mouth of which some individual placer-mining is usually done. A couple of hydraulic plants were formerly in operation lower down the river, but no information has as yet been obtained as to any operations this past summer. The chief quartz-mining was done on Cadwallader creek by the Coronation Mines, Ltd., a Victoria company, which did further development on the *Bend d'Or* and *Countless* group, opening some good-looking ore. Work was continued in the winter as well as the fine-weather season. The company reports having already broken a considerable tonnage of ore running better than $50 to the ton in gold, and that the development of the lower levels is very satisfactory. The stamp-mill—described in the 1910 Report—was not run this past season, but will be started next spring, with an abundant supply of ore to keep it running. Other properties that have been worked are the *Lorne*, *Pioneer*, and *Wayside*.

During the field-work season of 1912 A. M. Bateman, of the Geological Survey of Canada, made a preliminary examination of the economic mineral resources of the Bridge River country; also an exploratory trip from Lillooet to Chilko lake. A Survey Department note states that as a result of the latter trip the eastern border of the Coast Range batholith, which is in many places an important mining zone, was outlined, and the bordering strata found to be of Lower Cretaceous age instead of Palæozoic as was previously supposed.

COAST DISTRICT.

While coal-mining continues to be by far the most important class of mining in the Coast District, metalliferous mining is being done on a larger scale than in past years, and with much promise of permanence. Brief particulars of the Granby Consolidated Co.'s operations near Observatory inlet, in the Coast section of Skeena District, have already been given. In the southern part of the Coast District the metal-mining operations on Britannia mountain, on a larger, and on Texada island, on a smaller scale, are, in their respective degrees, of considerable moment.

Britannia Mines.—The extent to which the Britannia Mining and Smelting Co. has enlarged its mining and concentrating operations, and the present and steadily increasing importance of the copper-mining industry this company has established on its property on and near Howe Sound, are not generally known in the Province. Between 600 and 700 men have been continuously employed for some time past, and the extensive development and construction works in hand, and to be undertaken as soon as can be done with advantage, assure the retention of fully that number at work for some time to come. Outlining briefly what is being done, it may be mentioned that, while the mines are being developed and ore extracted on a larger scale than in past years, the work of driving a 5,000-foot adit is also in progress, with 3,000 feet already driven and a daily advance of about 15 feet being made. As this tunnel is being driven on a level 1,200 feet below the bottom of the lowest present mine-workings, it will, if ore be found to continue down to that depth (which will give a total of fully 2,200 feet), make accessible for stoping an enormous quantity of ore. Mine equipment on a commensurate scale, hydro-electric development of 5,000 horse-power, construction of railway from the mouth of the adit tunnel to Britannia Beach and other additional facilities for transportation, and the installation of a modern and effective system of ore-concentration, are included in the progressive programme adopted and being energetically carried out. It is understood that the "flotation process" of the

Minerals Separation, Ltd., for the recovery of copper minerals has been adopted here, and that a large treatment-capacity is being arranged for, with the old concentrating-mill being altered to suit the new conditions and for use pending the erection and equipment of a new mill.

The company mined about 193,000 tons of ore in 1912, as against rather more than 100,000 tons in 1911, and recovered between 14,000,000 and 15,000,000 lb. of copper and between 70,000 and 80,000 oz. of silver.

Texada Island.—The only metal-mining worthy of note done on Texada island during the year appears to have been that of the Tacoma Steel Co. at its *Marble Bay* mine. The ore produced was less in both quantity and average metal contents, owing chiefly to the necessity for doing more development-work before the mining of first-class ore could be continued. Sinking No. 2 shaft to the 13th level was completed, and at that level, the depth of which is about 1,100 feet, between 200 and 300 feet of driving was done. While this dead-work was in progress it was not practicable to mine much high-grade ore, so lower-grade ore that had been left in the upper levels was extracted and sent to the smelter at Tacoma. The quantity shipped was 17,870 tons, containing about 2,216 oz. gold, 22,400 oz. silver, and 1,031,000 lb. of copper. A new hoisting-engine was installed, and new picking-tables, ore-bins, and other conveniences put in; the storage-capacity of the shipping-bins at the water-front was increased to 1,000 tons. A considerable increase in output of ore is expected for 1913.

The *Copper Queen*, *Cornell*, and *Little Billy* are other copper-gold mines near Van Anda, but little mining was done at these. While much lime was shipped from the lime-kilns at the northern end of the island, there was no progress made toward utilizing the iron-ores of this island. The oil-fired furnace for smelting copper-ores, with which experimenting was done in 1911, was not operated commercially in 1912.

General.—Other than continued development of the *D. L. S.* group, on Princess Royal island, by the Surf Inlet Gold Mines, Ltd., not much productive metal-mining, apart from that already mentioned, was done in the Coast District, although prospect development has been in progress in a number of places, with encouraging results in several instances.

Coal-Mining on Vancouver Island.

In addition to the information concerning coal-mining on Vancouver Island, given earlier, it may be here stated that of an estimated aggregate production in 1912 of 1,553,000 long tons, the mines of the Canadian Collieries (Dunsmuir), Limited, produced about 662,000 tons; those of the Western Fuel Co., 594,000 tons; of the Pacific Coast Coal Mines, Ltd., 167,000 tons; and of the Vancouver-Nanaimo Coal Mining Co., Ltd., 130,000 tons. The demand for Vancouver Island coal continues to be in excess of the supply, for not a little coal-bunkering had to be done elsewhere by overseas vessels during the three months production was hindered by labour difficulties at the mines of the Canadian Collieries.

PROFITS OF MINING COMPANIES.

The net profits earned by companies operating metalliferous mines in British Columbia in 1912 are estimated at not less than $3,000,000. Amounts paid in dividends were as follows: By British Columbia Copper Co., $177,313; Consolidated Mining and Smelting Co., $232,208; Hedley Gold Mining Co., $360,000; Le Roi No. 2, Ltd., $29,400; and Standard Silver-lead Co., $425,000: total, $1,224,121. The Granby Consolidated Co. earned about $1,500,000 net, but reserved this amount for development and equipment of its Hidden Creek mines and smelting-works. The British Columbia Copper Co. in December

declared another dividend, amount $88,756, payable January 15th, 1913. The Hedley Gold Mining Co. earned about $47,500; the Consolidated Mining and Smelting Co., $78,138; and the British Columbia Copper Co. and Motherlode Sheep Creek Mining Co., substantial though unpublished amounts in excess of divided profits; and there are others. It will be seen, therefore, that 1912 was a profitable year for a number of the metalliferous mining companies.

CONCLUDING NOTES.

Just a few figures in conclusion. The aggregate value of the mineral production of British Columbia for all years to the end of 1912 is approximately $430,906,000. The greater progress of recent years may be the better recognized if some comparisons be made. The aggregate value for fifty-one years, 1852-1902, was $189,729,000; for ten years, 1903-1912, it was about $240,574,000. These figures show that nearly 57 per cent. of the aggregate production of sixty-one years was made during the ten years last past, leaving but a little more than 43 per cent. for the fifty-one years that went before. It is, therefore, plainly evident that in the last decade there has been progress of a marked character. Bringing comparison nearer to the present time, it may be shown, further, that the proportion of the last five years, 1908-1912, was $130,776,000, as against $109,798,000 for the five-year period 1903-1907. It is a striking fact that, of the value of the mineral production for the whole period of sixty-one years for which statistics are on official record, rather more than 30 per cent., or nearly one-third, was the production of the last five years. This, surely, is convincing evidence of the substantial and gratifying progress of the mining industry of British Columbia.

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